NASA SP-7011 (414)
May 1996

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Introduction

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Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

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Typical Report Citation and Abstract

ON MICROFICHE

ACCESSION NUMBER → **N96-10751#** Sandia National Labs., Albuquerque, NM. **← CORPORATE SOURCE**

TITLE → **Minimizing phylogenetic number to find good evolutionary trees**

AUTHORS → Goldberg, Leslie Ann; Goldberg, Paul W.; Phillips, Cynthia A.; Sweedyk, Elizabeth (California Univ., Berkeley, CA.); and Warnow, Tandy (Pennsylvania Univ., Philadelphia, PA.) **← AUTHORS' AFFILIATION**

PUBLICATION DATE → 1995 26 p Presented at the 1995 Symposium on Combinatorial Pattern Matching, Helsinki, Finland, 4-7 Jul. 1995 Sponsored by California Legislative Grant

CONTRACTS/GRANTS → Contract(s)/Grant(s): (DE-AC04-94AL-85000; NSF CCR-94-57800)

REPORT NO.(S) → Report No.(s): (DE95-011893; SAND-95-0831C; CONF-9507123-1) Avail: CASI HC A03/MF A01 **← AVAILABILITY AND PRICE CODE**

ABSTRACT → Inferring phylogenetic trees is a fundamental problem in computational-biology. We present a new objective criterion, the phylogenetic number, for evaluating evolutionary trees for species defined by biomolecular sequences or other qualitative characters. The phylogenetic number of a tree T is the maximum number of times that any given character state arises in T. By contrast, the classical parsimony criterion measures the total number of times that different character states arise in T. We consider the following related problems: finding the tree with minimum phylogenetic number, and computing the phylogenetic number of a given topology in which only the leaves are labeled by species. When the number of states is bounded (as is the case for biomolecular sequence characters), we can solve the second problem in polynomial time. We can also compute a fixed-topology 2-phylogeny (when one exists) for an arbitrary number of states. This algorithm can be used to further distinguish trees that are equal under parsimony. We also consider a number of other related problems.
DOE

SUBJECT TERMS → *Algorithms; Biological Evolution; Chemical Evolution; Genetics; Molecular Biology*

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 414)

MAY 1996

51 LIFE SCIENCES (GENERAL)

N96-17771 Polish Academy of Sciences, Warsaw (Poland). Inst. of Fundamental Technological Research.

Continuum dynamics of a peptide chain

Zorski, H.; and Infeld, E.; 10 Mar. 1995 60 p (ISSN 0208-5658)

Report No.(s): (IFTR-23/1995; NIPS-96-06852) Avail: Issuing Activity (Polish Academy of Sciences, Warsaw, Poland)

In this paper, we derive equations for the dynamics of a peptide chain in a quadrilateral chip model, assuming dipole interactions between adjacent peptide units and passing to the continuous limit. Dihedral interactions are included and, when strong, are seen to ensure stability. Hydrogen bonds, on the other hand, are not taken into account in the main calculation. All interactions are local in this model. These factors are sufficient to yield helical shapes as exact solutions. Hydrogen bonds are needed, however, to obtain eigenfrequencies, and when this (distinct) calculation is performed, peptide oscillations with frequencies of the order of 10(exp 13)/s are obtained, in agreement with observation. Solitons are only found in very restricted cases, so far. External forces, such as those due to the solvent, can be included in the model.

Author

Biological Models (mathematics); Biophysics; Continuum Modeling; Hydrogen Bonds; Molecular Chains; Molecular Interactions; Peptides;

N96-17822*# Texas Univ., Houston, TX. Dept. of Anesthesiology.

Body position does not affect the hemodynamic response to venous air embolism in dogs

Mehlhorn, Uwe; Burke, Edward J.; Butler, Bruce D.; Davis, Karen L.; Katz, Jeffrey; Melamed, Evan; Morris, William P.; and Allen, Steven J.; International Anesthesia Research Society 1 Jan. 1993 6 p Repr. from Anesth Analog, v. 79, 1994 p 734-739

Contract(s)/Grant(s): (NAG9-215) (ISSN 0003-2999)

Report No.(s): (NASA-CR-200031; NAS 1.26:200031; NIPS-96-07275) Copyright Avail: CASI HC A02/MF A01

Current therapy for massive venous air embolism (VAE) includes the use of the left lateral recumbent (LLR) position. This recommendation is based on animal studies, conducted 50 years ago, which looked primarily at survival. Little is known, however, about the concomitant hemodynamic response after VAE in various body positions. The purpose of this study was to investigate the hemodynamic and cardiovascular changes in various body positions after VAE. Twenty-two mechanically ventilated supine mongrel dogs received a venous air infusion of 2.5 mL/kg at a rate of 5 mL/s. One minute after the infusion, 100% oxygen ventilation was commenced and the body position of the dogs was changed to either the LLR (n = 6), the LLR with the head 10 deg down (LLR-10 deg; n = 6) or the right lateral recumbent (RLR; n = 5) position. Five dogs were maintained in the supine position (SUP; n = 5). One dog died in every group except in the SUP group, where all the dogs recovered. There were no significant differences among the various body positions in terms of heart rate, mean arterial pressure, pulmonary artery pressure, central venous pressure, left ventricular end-diastolic pressure, or cardiac output. The acute hemodynamic changes occurring during the first 5-15 min after VAE recovered to 80% of control within 60 min. Our data suggest that body repositioning does not influence the cardiovascular response to VAE. Specifically, our data do not support the recommendation of repositioning into the LLR position for the treatment of VAE.

Author

Aeroembolism; Aerospace Medicine; Hemodynamic Responses; Supine Position; Veins;

N96-17829 Foreign Broadcast Information Service, Washington, DC.

FBIS report: Science and technology. Central Eurasia

8 Dec. 1995 37 p Transl. into ENGLISH from various Central Eurasian articles

Report No.(s): (FBIS-UST-95-049; NIPS-96-07085) Copyright Avail: Issuing Activity (FBIS, PO Box 2604, Washington DC 20013-2604)

Abstracts of over 65 articles covering various topics in the life sciences are presented. Specific areas include pharmacology, biochemistry, public health, immunology, microbiology, and genetics.
CASI
Life Sciences; Research and Development; Russian Federation;

N96-18006# Tennessee Univ., Memphis, TN. Dept. of Anatomy and Neurobiology.
The activity of high-frequency vibratory sensitive neurons in monkey primary somatosensory cortex during the initiation of vibratory and visually cued hand movements Final Technical Report
Lebedev, Michael A.; and Nelson, Randall J.; 1995 22 p
Contract(s)/Grant(s): (AF-AFOSR-0333-91)
Report No.(s): (AD-A299869) Avail: CASI HC A03/MF A01

The activity of high-frequency vibratory sensitive (nFVS) neurons was recorded in monkey primary somatosensory cortex (SI) while animals performed wrist flexions and extensions in response to 27, 57 or 127 Hz palmar vibration or in response to visual stimuli serving as go-cues. HFVS neurons were distinguished by their best responsiveness to the highest frequency vibration (127 Hz) being better than to the lower frequencies. These neurons probably received input from Pacinian afferents. HFVS neurons formed a unique population that constituted approx. 4% of the task-related cells, and more frequently werefound in areas 3b and 1 (5.3% and 5.4% of the cells recorded in this areas, respectively) than in areas 3a or 2 (1.1% and 2.5%, respectively). Both vibration-entrained and non-entrained HFVS neurons were observed.
DTIC
Monkeys; Neurons; Sensitivity; Vibration; Wrist;

N96-18007# Tennessee Univ., Memphis, TN. Dept. of Anatomy and Neurobiology.
Rhythmically firing (20 - 50 Hz) neurons in monkey primary somatosensory cortex: Activity patterns during initiation of vibratory-cued hand movements. Enclosure number 1 Final Technical Report
Lebedev, Michael A.; and Nelson, Randall J.; 26 Jun. 1995 29 p
Contract(s)/Grant(s): (AF-AFOSR-0333-91)
Report No.(s): (AD-A299872) Avail: CASI HC A03/MF A01

The activity patterns of rhythmically firing neurons in monkey primary somatosensory cortex (SI) were studied during trained wrist movements that were performed in response to palmar vibration. Of 1,222 neurons extracellularly recorded in SI, 129 cells (11%) discharged rhythmically (at 30 Hz) during maintained wrist position. During the initiation of vibratory-cued movements, neuronal activity usually decreased at 25 ms after vibration onset followed by an additional decrease in activity at 60 ms prior to movement onset. Rhythmically firing neurons are not likely to be integrate-and-fire neurons because, during activity changes, their rhythmic firing pattern was disrupted rather than modulated. The activity pattern of rhythmically firing neurons was complimentary to that of quickly adapting SI neurons recorded during the performance of this task. Moreover, disruptions of rhythmic activity of individual SI neurons were similar to those reported previously for local field potential (LFP) oscillations in sensorimotor cortex during trained movements. However, rhythmic activity of SI neurons did not wax and wane like LFP oscillations. It has been suggested that fast (20 - 50 Hz) cortical oscillations may be initiated by inhibitory interneurons.
DTIC
Monkeys; Neurons; Neurophysiology; Sensory Perception; Wrist;

N96-18040# State Univ. of New York, Buffalo, NY. Dept. of Biochemical Pharmacology.
Electrostatic control of acetylcholinesterase reactivity Final Technical Report, 1 Apr. 1989 - 31 Dec. 1994
Berman, Harvey A.; 1 Jul. 1995 3 p
Contract(s)/Grant(s): (DAAL03-89-K-0063)
Report No.(s): (AD-A299909; ARO-26582-LS) Avail: CASI HC A01/MF A01

These studies examined chiral reactivity, the magnitude and importance of steric interactions, and the importance of the electrostatic charge distribution in governing reactivity of acetylcholinesterase (AchE). To do this, we employed a comprehensive series of resolved enantiomeric methylphosphonates, a comprehensive series of alkylphosphonates, and fluorescent methylphosphonates. As a complementary index to detailed stopped-flow analysis of inhibition kinetics, we monitored kinetics of aging and oxime reactivation. Together with equilibrium binding studies, employing the reversible fluorescent ligand decidium diiodide, these provided an independent index of ligand orientation achieved by the organophosphonates within the enzyme active center.
DTIC
Acetyl Compounds; Aging (materials); Charge Distribution; Cholinesterase; Electrostatic Charge; Organic Phosphorus Compounds; Reactivity;

N96-18053# Oak Ridge National Lab., TN.
Laser desorption mass spectrometry for fast DNA analysis
Chen, C. H.; Chang, L. Y.; Taranenko, N. I.; Allman, S. L.; Tang, K.; and Matteson, K. J.; 1995 9 p Presented at the Chinese-American Academic and Professional Association in United States (CAPASUS) Conference, Atlanta, GA, 23-25 Jun. 1995
Contract(s)/Grant(s): (DE-AC05-84OR-21400)

Report No.(s): (DE95-017392; CONF-9506258-1) Avail: CASI HC A02/MF A01

During the past few years, major effort has been directed toward developing mass spectrometry to measure biopolymers because of the great potential benefit to biomedical research. Hellenkamp and his co-workers were the first to report that large polypeptide molecules can be ionized and detected without significant fragmentation when a greater number of nicotinic acid molecules are used as a matrix. This method is now well known as matrix-assisted laser desorption/ionization (MALDI). Since then, various groups have reported measurements of very large proteins by MALDI. Reliable protein analysis by MALDI is more or less well established. However, the application of MALDI to nucleic acids analysis has been found to be much more difficult. Most research on the measurement of nucleic acid by MALDI were stimulated by the Human Genome Project. Up to now, the only method for reliable routine analysis of nucleic acid is gel electrophoresis. Different sizes of nucleic acids can be separated in gel medium when a high electric field is applied to the gel. However, the time needed to separate different sizes of DNA segments usually takes from several minutes to several hours. If MALDI can be successfully used for nucleic acids analysis, the analysis time can be reduced to less than 1 millisecond. In addition, no tagging with radioactive materials or chemical dyes is needed. In this work, we will review recent progress related to MALDI for DNA analysis.

DOE

Biopolymers; Chemical Analysis; Deoxyribonucleic Acid; Desorption; Ionization; Mass Spectroscopy; Nucleic Acids;

N96-18124*# Dayton Univ., OH. Dept. of Biology.

General lighting requirements for photosynthesis c51

Geiger, Donald R.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 3-18 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

This paper presents data that suggests some criteria for evaluating growth chamber and greenhouse lighting. A review of the general lighting requirements for photosynthesis reveals that four aspects of light are important: irradiance, quality, timing, and duration. Effective lighting should produce plants that perform according to the goals of the project. For example, for physiological studies the plants probably should exhibit morphology and physiology similar to that found in field-grown plants. For other projects the criteria will obviously be set according to the reason for raising the plants.

Derived from text

Illuminating; Irradiance; Light (visible Radiation); Photosynthesis; Plants (botany); Spectral Emission;

N96-18125*# Department of Agriculture, Beltsville, MD. Climate Stress Lab.

Regulation of assimilate partitioning by daylength and spectral quality c51

Britz, Steve J.; In Wisconsin Univ., International Lighting in Controlled Environme nts Workshop 1 Mar. 1994 p 19-24 (For primary document see N96-18123 05-54) Avail: CASI HC A02/MF A03

The effects of daylength and spectral quality on assimilate partitioning and leaf carbohydrate content should be considered when conducting controlled environment experiments or comparing results between studies obtained under different lighting conditions. Changes in partitioning may indicate alterations to photoregulatory processes within the source leaf rather than disruptions in sink strength. Moreover, it may be possible to use photoregulatory responses of assimilate partitioning to probe mechanisms of growth and development involving translocation of carbon or adaptation to environmental factors such as elevated CO2. It may also be possible to steer assimilate partitioning for the benefit of controlled environment agriculture using energy-efficient manipulations such as daylength extensions with dim irradiances, end-of-day alterations in light quality, or shifting plants between different spectral qualities as a part of phasic control of growth and development. Note that high starch levels measured on a one-time basis provide little information, since it is the proportion of photosynthate stored as starch that is meaningful. Large differences in starch content can result from small changes in partitioning integrated over several days. Rate information is required.

Derived from text

Controlled Atmospheres; Daytime; Diurnal Variations; Illuminating; Light (visible Radiation); Plants (botany); Radiation Spectra;

N96-18126*# Academy of Sciences (USSR), Krasnoyarsk (USSR). Inst. of Biophysics.

Spectral composition of light and growing of plants in controlled environments c51

Tikhomirov, Alexander A.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 25-29 (For primary document see N96- 18123 05-54) Avail: CASI HC A01/MF A03

The main conclusions of many investigations about general requirements of plants for spectral composition of PAR (photosynthetically active radiation) are based on phylogenetic aspects of plant growth. We think that these aspects are not the main criteria in choosing the spectral composition required for growing plants in controlled conditions. Our approach to this problem is based on plant and crop reaction under long duration growth with specific spectra and intensity. Only in this way can we determine correctly the role of light characteristics for developing crops.

Derived from text

Controlled Atmospheres; Illuminating; Photosynthesis; Radiation Spectra; Spectrum Analysis; Vegetation Growth;

N96-18127*# Academy of Sciences (USSR), Krasnoyarsk (USSR). Inst. of Biophysics.

Optimization of lamp spectrum for vegetable growth c51

Prikupets, L. B.; and Tikhomirov, A. A.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 31-38 (For primary document see N96-18123 05-54) Avail: CASI HC A02/MF A03

An increase in the demand for and production of vegetables in the winter, mainly in northern and Siberian regions, inevitably leads to mass building of structures for growing plants under completely artificial conditions. An industrial lighting technology is required whose main parameters (spectrum, irradiance, photoperiod) should be assigned carefully and should uniquely determine, along with other important characteristics of the artificial climate, the productivity of the plant-production facility. The most widespread crops grown in our country under indoor conditions are cucumber and tomato plants, which account for more than 98% of the area in greenhouses. These plants are good prospects for growing completely under intense artificial lighting conditions (photocultures). Optimization of the main parameters of optical radiation when growing these plants is the most important task of achieving their profitable production. At present, considerable experience has been gained in studying the dependence of productivity of cucumber and tomato communities on irradiation conditions. Fundamental studies of the Agrophysical Research Institute of the Russian Academy of Sciences, Timiryazev Institute of Plant Physiology of the Russian Academy of Sciences, Timiryazev Agricultural Academy, and other institutes create a good basis for a detailed study of the given problem. Commercial sources of radiation substantially differing in spectral characteristics in the region of photosynthetically active radiation (PAR) were used in the studies.

Derived from text

Farm Crops; Illuminating; Luminaires; Optical Properties; Radiation Spectra; Vegetation Growth;

N96-18128*# Utah State Univ., Logan, UT. Dept. of Plants, Soils, and Biometeorology.

Effects of radiation quality, intensity, and duration on photosynthesis and growth c51

Bugbee, Bruce; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 39-50 Sponsored by the Utah Agricultural Experiment Station (For primary document see N96-18123 05-54)

Contract(s)/Grant(s): (NCC2-139) Avail: CASI HC A03/MF A03

Differences in radiation quality from the six most common electric lamps have little effect on photosynthetic rate. Radiation quality primarily alters growth because of changes in branching or internode elongation, which change radiation absorption. Growth and yield in wheat appear to be insensitive to radiation quality. Growth and yield in soybeans can be slightly increased under high pressure sodium (HPS) lamps compared to metal halide lamps, in spite of greatly reduced chlorophyll concentrations under HPS lamps. Daily integrated photosynthetic photon flux (mol m(exp-2)d(exp-1)) most directly determines leaf anatomy and growth. Photosynthetic photon flux (PPF) levels of 800 (mu)mol m(exp-2)s(exp-1) are adequate to simulate field daily-integrated PPF levels for both short and long day plants, but plant canopies can benefit from much higher PPF levels.

Derived from text

Controlled Atmospheres; Luminaires; Photosynthesis; Radiant Flux Density; Radiation Effects; Vegetation Growth;

N96-18129*# Rutgers Univ., New Brunswick, NJ. Dept. of Plant Science.

Light period regulation of carbohydrate partitioning c51

Janes, Harry W.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 51 (For primary document see N96-18123 05-54) Avail: CASI HC A01/MF A03

We have shown that the photosynthetic period is important in regulating carbon partitioning. Even when the same amount of carbon is fixed over a 24h period considerably more is translocated out of the leaf under the longer photosynthetic period. This is extremely important when parts of the plant other than the leaves are to be sold. It is also important to notice the amount of carbon respired in the short photosynthetic period. The light period effect on carbohydrate fixation, dark respiration, and translocation is shown in this report.

Derived from text

Carbohydrates; Exposure; Luminaires; Photosynthesis; Time Dependence; Vegetation Growth;

N96-18130*# IMAG-DLO, Wageningen (Netherlands).

Leaf absorbance and photosynthesis c51

Schurer, Kees; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 53-54 (For primary document see N96-18123 05-54) Avail: CASI HC A01/MF A03

The absorption spectrum of a leaf is often thought to contain some clues to the photosynthetic action spectrum of chlorophyll. Of course, absorption of photons is needed for photosynthesis, but the reverse, photosynthesis when there is absorption, is not necessarily true. As a check on the existence of absorption limits we measured spectra for a few different leaves. Two techniques for measuring absorption have been used, viz. the separate determination of the diffuse reflectance and the diffuse transmittance with the leaf at a

port of an integrating sphere and the direct determination of the non-absorbed fraction with the leaf in the sphere. In a cross-check both methods yielded the same results for the absorption spectrum. The spectrum of a Fuchsia leaf, covering the short-wave region from 350 to 2500 nm, shows a high absorption in UV, blue and red, the well known dip in the green and a steep fall-off at 700 nm. Absorption drops to virtually zero in the near infrared, with subsequent absorptions, corresponding to the water absorption bands. In more detailed spectra, taken at 5 nm intervals with a 5 nm bandwidth, differences in chlorophyll content show in the different depths of the dip around 550 nm and in a small shift of the absorption edge at 700 nm. Spectra for Geranium (Pelargonium zonale) and Hibiscus (with a higher chlorophyll content) show that the upper limit for photosynthesis can not be much above 700 nm. No evidence, however, is to be seen of a lower limit for photosynthesis and, in fact, some experiments down to 300 nm still did not show a decrease of the absorption although it is well recognized that no photosynthesis results with 300 nm wavelengths.
Author (revised)
Absorption Spectra; Chlorophylls; Photoabsorption; Photosynthesis; Radiation Spectra;

N96-18131*# Leicester Univ. (England). Dept. of Botany.
Phytochrome-mediated responses: Implications for controlled environment research facilities c51
Smith, Harry; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 57-67 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

Light is undoubtedly the most important environmental variable for plant growth and development; plants not only use radiant energy in photosynthesis, they also respond to the quantity, quality, direction and timing of incident radiation through photomorphogenic response that can have huge effects on the rate of growth and the pattern of development. It is surprising, therefore, that the manufacturers and suppliers of controlled environment facilities have been singularly uninventive in the design of the lighting assemblies they provide. The consumer has one choice only - a lighting assembly that provides irradiance levels usually only a fraction of sunlight, and a control system that is limited to regulating the timing of the on-off switch. The reasons for these limitations are partly technological, but in the main they result from ignorance on the part of both the consumer and the manufacturer. A specific and powerful example of this ignorance relates to the importance of the so-called far-red wavelengths (FR = 700-800 nm). Because the human eye can hardly detect wavelengths above 700 nm, and photosynthesis also cuts off at about 700 nm, the majority of plant and crop physiologists are still almost completely unaware that FR radiation can have massive effects on growth rate and development. In consequence, most growth cabinets have light sources based on fluorescent tubes, and provide very little FR apart from that emitted by a token number of small incandescent bulbs. Larger growth facilities often use broader spectrum light sources, but growth facilities that provide the capability to vary the FR incident upon the plants are about as abundant as seals in the Sahara. This article sets the background of the significance of FR radiation in the natural environment and its importance for plant growth and development in the hope that it might inform intelligently those concerned with improving the design of plant growth facilities.
Author
Controlled Atmospheres; Illuminating; Photosynthesis; Plants (botany); Sunlight; Vegetation Growth;

N96-18132*# North Carolina State Univ., Raleigh, NC. Southeastern Plant Environment Lab.
History and applications in controlled environments c51
Downs, R. J.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 69-87 Sponsored by the North Carolina Agricultural Research Service. (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

The widespread application of electric (often called artificial) light in greenhouses, growing rooms, and plant growth chambers would presuppose that the role of phytochrome would be considered in the selection and use of such lighting systems. Unfortunately this is not usually the case. Part of the problem is that many students, and indeed an unfortunate number of senior scientists, seem to regard phytochrome as a laboratory phenomenon without much application in the real world. They simply have not grasped the concept that phytochrome is functioning through all stages of plant development, wherever plants are grown. It is certainly true, as Meijer (1971) stated, that one cannot compare experimental results obtained under very strict laboratory conditions with plant irradiation in glasshouses and in growth rooms. When Karl Norris developed the first practical portable spectroradiometer about 1962, some of the first measurements were to determine the red/far-red ratios under tree canopies. These measurements showed clearly the predominance of far-red in the understory and suggested that far-red was contributing to the elongation exhibited by many species growing in the shade, and possibly was a factor in the induction of light requirements in seeds. Subsequently we used Catalpa leaves as far-red filters to make light-insensitive lettuce seed light requiring. Much more detailed work has since been done on phytochrome effects in the natural environment, and it is encouraging to note that efforts are bring made to apply phytochrome research to horticulture.
Derived from text
Canopies (vegetation); Greenhouses; Illuminating; Light Sources; Plants (botany); Vegetation Growth;

N96-18133*# Buenos Aires Univ. (Argentina).

Plant photomorphogenesis and canopy growth c51

Ballare, Carlos L.; and Scopel, Ana L.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 89-102 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

An important motivation for studying photomorphogenesis is to understand the relationships among plant photophysiology in canopies, canopy productivity, and agronomic yield. This understanding is essential to optimize lighting systems used for plant farming in controlled environments (CE) and for the design of genetically engineered crop strains with altered photoresponses. This article provides an overview of some basic principles of plant photomorphogenesis in canopies and discusses their implications for (1) scaling up information on plant photophysiology from individual plants in CE to whole canopies in the field, and (2) designing lighting conditions to increase plant productivity in CE used for agronomic purposes (e.g. space farming in CE Life Support Systems). We concentrate on the visible (lambda between 400 and 700 nm) and far-infrared (FR; lambda greater than 700 nm) spectral regions, since the ultraviolet (UV; 280 to 400 nm) is covered by other authors in this volume.

Derived from text

Canopies (vegetation); Controlled Atmospheres; Far Infrared Radiation; Illuminating; Plants (botany); Vegetation Growth;

N96-18134*# Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.

Phytochrome, plant growth and flowering c51

King, R. W.; and Bagnall, D. J.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 103-109 (For primary document see N96-18123 05-54) Avail: CASI HC A02/MF A03

Attempts to use artificially lit cabinets to grow plants identical to those growing in sunlight have provided compelling evidence of the importance of light quality for plant growth. Changing the balance of red (R) to far-red (FR) radiation, but with a fixed photosynthetic input can shift the phytochrome photoequilibrium in a plant and generate large differences in plant growth. With FR enrichment the plants elongate, and may produce more leaf area and dry matter. Similar morphogenic responses are also obtained when light quality is altered only briefly (15-30 min) at the end-of-the-day. Conversely, for plants grown in natural conditions the response of plant form to selective spectral filtering has again shown that red and far-red wavebands are important as found by Kasperbauer and coworkers. Also, where photosynthetic photon flux densities (PPFD) of sunlight have been held constant, the removal of far-red alone alters plant growth. With FR depletion plants grown in sunlight are small, more branched and darker green. Here we examine the implications for plant growth and flowering when the far-red composition of incident radiation in plant growth chambers is manipulated.

Derived from text

Incident Radiation; Light Sources; Photosynthesis; Plants (botany); Sunlight; Vegetation Growth;

N96-18135*# Utah State Univ., Logan, UT. Dept. of Range Science and the Ecology Center.

Lighting considerations in controlled environments for nonphotosynthetic plant responses to blue and ultraviolet radiation c51

Caldwell, M. M.; and Flint, S. D.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 113-124 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

This essay will consider both physical and photobiological aspects of controlled environment lighting in the spectral region beginning in the blue and taken to the normal limit of the solar spectrum in the ultraviolet. The primary emphasis is directed to questions of plant response to sunlight. Measurement and computations used in radiation dosimetry in this part of the spectrum are also briefly treated. Because of interest in the ozone depletion problem, there has been some activity in plant UV-B research and there are several recent reviews available. Some aspects of growth chamber lighting as it relates to UV-B research were covered earlier. Apart from work related to the blue/UV-A receptor, less attention has been given to UV-A responses.

Derived from text

Controlled Atmospheres; Light (visible Radiation); Light Sources; Photosynthesis; Plants (botany); Sunlight; Ultraviolet Radiation;

N96-18136*# Marburg Univ. (Germany).

UV-A/Blue-Light responses in algae c51

Senger, Horst; and Hermsmeier, Dieter; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 125-142 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

All life on earth depends on light. A variety of photoreceptors capture the light for a wide range of reactions. Photosynthetic organisms absorb the light necessary for energy transformation and charge separation facilitating photosynthesis. In addition to the bulk pigments there is a great diversity of photoreceptors present in minute concentrations that control development, metabolism and orientation of plants and microorganisms. Based on its spectral absorbance, the well-studied phytochrome system acts in the RL (red light) region as well as in the UV-A/BL (blue light) region where the above mentioned reactions are mediated by a variety of photoreceptors whose natures are largely unknown. Phyllogenetically the UV-A/BL photoreceptors seem to be more

ancient pigments that eventually were replaced by the phytochrome system. However, there are many reports that suggest a coaction between the UV-A/BL receptors and the phytochrome system. In several cases the UV-A/BL activation is the prerequisite for the phytochrome reaction. Historically it was the German botanist Julius Sachs who first discovered in 1864 that phototropism in plants was due to BL reactions. It took over 70 years until Bunning (1937) and Galston and Baker (1949) rediscovered the BL response. Since then, an ever-increasing attention has been paid to this effect. In this contribution, the general aspect of UV-A/BL responses and especially the responsiveness of algae will be covered.
Derived from text
Algae; Light (visible Radiation); Light Sources; Photoreceptors; Photosynthesis; Ultraviolet Radiation;

N96-18137*# Kobe Women's Univ., Kobe (Japan). Dept. of Life Science.
Requirements of blue, UV-A, and UV-B light for normal growth of higher plants, as assessed by action spectra for growth and related phenomena c51
Hashimoto, T.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 143-157 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

Artificial lighting is very important for experimental purposes, as well as for the practical use of plants when not enough sunlight is available. To grow green higher plants in their normal forms under artificial lighting constructing efficient and economically reasonable lighting systems is not an easy task. One possible approach would be to simulate sunlight in intensity and the radiation spectrum, but its high construction and running costs are not likely to allow its use in practice. Sunlight may be excessive in irradiance in some or all portions of the spectrum. Reducing irradiance and removing unnecessary wavebands might lead to an economically feasible light source. However, removing or reducing a particular waveband from sunlight for testing is not easy. Another approach might be to find the wavebands required for respective aspects of plant growth and to combine them in a proper ratio and intensity. The latter approach seems more practical and economical, and the aim of this Workshop lies in advancing this approach. I summarize our present knowledge on the waveband requirements of higher plants for the regions of blue, UV-A and UV-B.
Derived from text
Light (visible Radiation); Light Sources; Plants (botany); Spectra; Sunlight; Ultraviolet Radiation; Vegetation Growth;

N96-18145*# Institute of Biomedical Problems, Moscow (USSR).
Enhancement of efficiency in the use of light for cultivation of plants in controlled ecological systems c51
Mashinsky, A. L.; Oreshkin, V. I.; and Nechitailo, G. S.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 221-223 (For primary document see N96-18123 05-54) Avail: CASI HC A01/MF A03

The problems of plant cultivation with the use of artificial lighting are related to energetics and, initially, to the lack of effective sources for photosynthesis, secondly to the necessity to supply a system with a considerable power in the form of light energy and to remove transformed thermal energy, and finally to economic considerations. These problems are solved by three ways: by the choice of effective radiation sources, design approaches, and technological methods of cultivation. Here we shall consider the first two ways.
Derived from text
Ecosystems; Light Sources; Luminaires; Plants (botany); Vegetation Growth;

N96-18146*# Laboratory of Engineering Problems of Phytotron, Odessa (Ukraine).
Systems of artificial lighting at the Phytotron of Plant Breeding and Genetic Institute (Odessa) c51
Chernozubov, Adolf; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 225 (For primary document see N96-18123 05-54) Avail: CASI HC A01/MF A03

At the Odessa Phytotron we have installed over 50 climatic chambers and cabinets made by various companies of the United States, Canada, Germany and U.S.S.R. They employ different light sources including Sylvania fluorescent lamps of various types, fluorescent lamps produced in the former Soviet Union with a special luminophore, ordinary tungsten lamps, xenon, mercury, mercury-iodide, sodium, etc. Our objective in lighting is that the intensity distribution over the wave lengths should be maximal in the photosynthetically active part of the spectrum and minimal in the IR part to avoid plant sterilization. Phytotrons are extremely energy consuming entities, and the large part of their energy consumption falls into the lighting category in our electric bills. Therefore, we are in a constant search of the processes to reduce energy. However, the main way to increase effectiveness would be the development of new types of light sources, which would come close to the threshold of 150 to 200 lumens per watt.
Derived from text
Fluorescence; Light Sources; Luminaires; Phytotrons; Plants (botany); Vegetation Growth;

N96-18147*# Gesellschaft fuer Strahlen- und Umweltforschung m.b.h., Oberschleissheim (Germany).
Xenon lighting adjusted to plant requirements c51
Koefferlein, M.; Doehring, T.; Payer, Hans D.; and Seidlitz, H. K.; In Wisconsin Univ., International Lighting in Con-

trolled Environments Workshop 1 Mar. 1994 p 229-242 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

Xenon lamps are available as low and high power lamps with relatively high efficiency and a relatively long lifetime up to several thousand hours. Different construction types of short-arc and long-arc lamps permit a good adaptation to various applications in projection and illumination techniques without substantial changes of the spectral quality. Hence, the xenon lamp was the best choice for professional technical purposes where high power at simultaneously good spectral quality of the light was required. However, technical development does not stand still. Between the luminous efficacy of xenon lamps of 25-50 lm/W and the theoretical limit for 'white light' of 250 lm/W is still much room for improvement. The present development mainly favors other lamp types, like metal halide lamps and fluorescent lamps for commercial lighting purposes. The enclosed sections deal with some of the properties of xenon lamps relevant to plant illumination; particularly the spectral aspects, the temporal characteristics of the emission, and finally the economy of xenon lamps will be addressed. Due to radiation exceeding the natural global radiation in both the ultraviolet (UV) and the infrared (IR) regions, filter techniques have to be included into the discussion referring to the requirements of plant illumination. Most of the presented results were obtained by investigations in the GSF phytotron or in the closed Phytocell chambers of the University of Erlangen. As our experiences are restricted to area plant illumination rather than spot lights our discussion will concentrate on low pressure long-arc xenon lamps which are commonly used for such plant illuminations. As the spectral properties of short-arc lamps do not differ much from those of long-arc lamps most of our conclusions will be valid for high pressure xenon lamps too. These lamps often serve as light sources for small sun simulators and for monochromators which are used for action spectroscopy of plant responses.

Derived from text

Costs; Illuminating; Light Sources; Plants (botany); Xenon Lamps;

N96-18148*# Fusion Systems Corp., Rockville, MD.

Efficient, full-spectrum, long-lived, non-toxic microwave lamp for plant growth c51

Maclennan, Donald A.; Turner, Brian P.; Dolan, James T.; Ury, Michael G.; and Gustafson, Paul; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 243-254 (For primary document see N96-18123 05-54)

Contract(s)/Grant(s): (NAS10-11987) Avail: CASI HC A03/MF A03

Fusion Systems Corporation has developed a mercury-free, low infrared, efficient microwave lamp using a benign sulfur based fill optimized for visible light. Our literature search and discussions with researchers directed us to enhance the bulbs red output. We have demonstrated a photosynthetic efficacy of over 2 micro-moles per microwave joule which corresponds to over 1.3 micro-moles per joule at the power main. Recent work has shown we can make additional increases in overall system efficiency. During the next two years, we expect to demonstrate a system capable of producing more than 1.5 micro-moles/joule measured at the power main with significantly less IR than alternative lamp systems. We determined optimal plant growth light requirements via a literature search and researcher input. We surveyed candidate lamp fill materials to be used in combination with sulfur and explored several methods of increasing photosynthetic efficacy.

Derived from text

Luminaires; Microwaves; Plants (botany); System Effectiveness; Vegetation Growth;

N96-18149*# Wisconsin Univ., Madison, WI. Center for Space Automation and Robotics.

Light emitting diodes as a plant lighting source c51

Bula, R. J.; Tennessen, D. J.; Morrow, R. C.; and Tibbitts, T. W.; In its International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 255-267 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

Electroluminescence in solid materials is defined as the generation of light by the passage of an electric current through a body of solid material under an applied electric field. A specific type of electroluminescence, first noted in 1923, involves the generation of photons when electrons are passed through a p-n junction of certain solid materials (junction of a n-type semiconductor, an electron donor, and a p-type semiconductor, an electron acceptor). The development of this light emitting semiconductor technology dates back less than 30 years. During this period of time, the LED has evolved from a rare and expensive light generating device to one of the most widely used electronic components. A number of LED characteristics are of considerable importance in selecting a light source for plant lighting in a controlled environment facility. Of particular importance is the characteristic that light is generated by an LED at a rate far greater than the corresponding thermal radiation predicted by the bulk temperature of the device as defined by Plank's radiation law. This is in sharp contrast to other light sources, such as an incandescent or high intensity discharge lamp. A plant lighting system for controlled environments must provide plants with an adequate flux of photosynthetically active radiation, plus providing photons in the spectral regions that are involved in the photomorphogenic and phototropic responses that result in normal plant growth and development. Use of light sources that emit photons over a broad spectral range generally meet these two lighting requirements. Since the LED's emit over specific spectral regions, they must be carefully selected so that the levels of

photsynthetically active and photomorphogenic and phototropic radiation meet these plant requirements.
Derived from text
Illuminating; Light Emitting Diodes; Light Sources; Luminaires; Plants (botany); Vegetation Growth;

N96-18158*# Clemson Univ., SC. Agricultural and Biological Engineering Dept.
Spectral filtering for plant production c51
Young, Roy E.; McMahon, Margaret J.; (Ohio State Univ., Cleveland, OH.)Rajapakse, Nihal C.; and Decoteau, Dennis R.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 337-349 (For primary document see N96-18123 05-54) Avail: CASI HC A03/MF A03

Both plants and animals have one general commonality in their perception of light. They both are sensitive primarily to the 400 to 700 nm wavelength portion of the electromagnetic spectrum. This is referred to as the visible spectrum for animals and as the photosynthetically active radiation (PAR) spectrum for plants. Within this portion of the spectrum, animals perceive colors. Relatively recently it has been learned that within this same spectral range plants also demonstrate varying responses at different wavelengths, somewhat analogous to the definition of various colors at specific wavelengths. Although invisible to the human eye, portions of the electromagnetic spectrum on either side of the visible range are relatively inactive photosynthetically but have been found to influence important biological functions. These portions include the ultraviolet (UV approximately equal to 280-400 nm) and the far-red (FR approximately equal to 700-800 nm). The basic photoreceptor of plants for photosynthesis is chlorophyll. It serves to capture radiant energy which combined with carbon dioxide and water produces oxygen and assimulated carbon, used for the synthesis of cell wall polysaccarides, proteins, membrane lipids and other cellular constituents. The energy and carbon building blocks of photosynthesis sustain growth of plants. On the other hand, however, there are other photoreceptors, or pigments, that function as signal transducers to provide information that controls many physiological and morphological responses of how a plant grows. Known photomorphogenic receptors include phytochrome (the red/far-red sensor in the narrow bands of 655-665 nm and 725-735 nm ranges, respectively) and 'cryptochrome' (the hypothetical UV-B sensor in the 280-320 nm range). Since the USDA team of W. L. Butler, S. B. Hendricks, H. A. Borthwick, H. A. Siegleman and K. Norris in Beltsville, MD detected by spectroscopy, extracted and identified phytochrome as a protein in the 1950's, many other investigators have found evidence of its control functions in plants. Considerably less, however, is known about the yet non-isolated cryptochrome. The information-transferring roles of photoreceptors in plants at specific spectral ranges quite naturally stimulated plant scientists and engineers to consider physically manipulating light to achieve desired physiological and morphological characteristics. One way to manipulate light is to filter it through materials that selectively transmit portions of the sun's spectrum in and near the PAR range.
Derived from text
Chlorophylls; Environmental Engineering; Light Transmission; Optical Filters; Photoreceptors; Photosensitivity; Photosynthesis; Plants (botany); Technology Utilization; Vegetation Growth;

N96-18400*# Cincinnati Univ., OH. Dept. of Pediatrics.
Effects of microgravity on epidermal development in the rat Final Report
Hoath, Steven B.; 31 Dec. 1995 11 p
Contract(s)/Grant(s): (NCC2-865)
Report No.(s): (NASA-CR-200130; NAS 1.26:200130; NIPS-96-07885) Avail: CASI HC A03/MF A01

The overall goal of this project was to investigate the effects of prolonged weightlessness on the development of the skin in the fetal and newborn rat. Specifically, we used the NASA microgravitational rat model to test the following hypotheses: (1) Exposure of the pregnant rat to microscopy during late gestation will diminish the transport of calcium across the placenta from the mother to the fetus leading to decreases in total epidermal and dermal calcium content; (2) Microgravity will lead to slowing of body growth and diminish the rate of formation of the outermost layer of the epidermis and the stratum corneum; and (3) Microgravity will lead to formation of a stratum corneum with decreased DC electrical resistance and increased permeability to tritiated water.
Derived from text
Aerospace Medicine; Calcium; Differentiation (biology); Epidermis; Fetuses; Microgravity; Morphology; Physiological Responses; Rats; Transport Properties;

N96-18403*# Carolinas Medical Center, Charlotte, NC. Dept. of General Surgery Research.
Spaceflight and immune responses of rhesus monkeys Progress Report, Jan. - Dec. 1995
Sonnenfeld, Gerald; Morton, Darla S.; Swiggett, Jeanene P.; Hakenewerth, Anne M.; and Fowler, Nina A.; 1 Dec. 1995 16 p
Contract(s)/Grant(s): (NAG2-933)
Report No.(s): (NASA-CR-199983; NAS 1.26:199983; NIPS-96-07067) Avail: CASI HC A03/MF A01

The effects of restraint on immunological parameters was determined in an 18 day ARRT (adult rhesus restraint test). The monkeys were restrained for 18 days in the experimental station for the orbiting primate (ESOP), the chair of choice for Space Shuttle experiments. Several immunological parameters were determined using peripheral blood, bone marrow, and lymph node specimens from the monkeys.

The parameters included: response of bone marrow cells to GM-CSF (granulocyte-macrophage colony stimulating factor), leukocyte subset distribution, and production of IFN-a (interferon-alpha) and IFN-gamma (interferon-gamma). The only parameter changed after 18 days of restraint was the percentage of CD8+ T cells. No other immunological parameters showed changes due to restraint. Handling and changes in housing prior to the restraint period did apparently result in some restraint-independent immunological changes. Handling must be kept to a minimum and the animals allowed time to recover prior to flight. All experiments must be carefully controlled. Restraint does not appear to be a major issue regarding the effects of space flight on immune responses.
Author
Immune Systems; Immunology; Monkeys; Physiological Responses; Space Flight;

N96-18793# Los Alamos National Lab., NM.
Diffusion of a protein in configuration space
Garcia, A. E.; Blumenfeld, R.; Hummer, G.; and Sobehart, J.; 1995 27 p Presented at the 9th Conversation in Biomolecular Stereodynamics, Albany, NY, 20-24 Jun. 1995
Contract(s)/Grant(s): (W-7405-ENG-36)
Report No.(s): (DE96-000024; LA-UR-95-2962; CONF-9506267-1) Avail: CASI HC A03/MF A01

Simulations of biomolecular dynamics are commonly interpreted in terms of harmonic or quasi-harmonic models for the dynamics of the system. These models assume that biomolecules exhibit oscillations around a single energy minimum. However, spectroscopic data on myoglobin suggest that proteins sample multiple minima. Transitions between minima reveal a broad distribution of energy barriers. This behavior has been observed in other biomolecular systems. To elucidate the nature of protein dynamics the authors have studied a 1.2ns molecular dynamics trajectory of crambin in aqueous solution. This trajectory samples multiple local energy minima. Transitions between minima involve collective motions of amino acids over long distances. The authors show that nonlinear motions are responsible for most of the atomic fluctuations of the protein. These atomic fluctuations are not well described by large motions of individual atoms or a small group of atoms, but rather by concerted motions of many atoms. These nonlinear motions describe transitions between different basins of attraction. The signature of these motions manifests in local and global structural variables. A method for extracting Molecule Optimal Dynamic Coordinates (MODC) is presented.
DOE
Amino Acids; Aqueous Solutions; Biochemistry; Diffusion; Oscillations; Proteins; Simulation;

N96-18868# ManTech Environmental Technology, Inc., Dayton, OH.
Reproductive toxicity screen of 1,3,5-trinitrobenzene administered in the diet of Sprague-Dawley rats Final Report, Sep. 1993 - Jun. 1994
Kinkead, E. R.; Wolfe, R. E.; Flemming, C. D.; Caldwell, D. J.; (Walter Reed Army Inst. of Research, Wright-Patterson AFB, OH.)Miller, C. R.; (Walter Reed Army Inst. of Research, Wright-Patterson AFB, OH.)and Marit, G. B.; (Armstrong Lab., Wright-Patterson AFB, OH.) Oct. 1994 52 p
Contract(s)/Grant(s): (F33615-90-C-0532; AF PROJ. 6302)
Report No.(s): (AD-A298912; AL/OE-TR-1994-0144) Avail: CASI HC A04/MF A01

Several Army installations targeted for restoration have measurable quantities of 1,3,5-trinitrobenzene (TNB) in the soil and ground water. As part of the process to develop environmental and health effects criteria for restoration, a modified Screening Information Data Set (SIDS) reproductive study was performed. Male and female Sprague-Dawley rats received diet containing approximately 300, 150, or 30 mg TNB/kg diet. Mating occurred following 14 days of treatment. All dams, one-half the males, and representative pups were maintained for a total of 90 days of treatment. No mortality occurred during the study; however, a decrease in mean body weights was noted in both sexes of high-dose rats. A dose-related effect was noted in measurements of sperm function/activity. Sperm depletion and degeneration of the seminiferous tubules were noted histopathologically. Methemoglobinemia and splenic hemosiderosis were common findings in the high- and mid-dose levels of both sexes at necropsy. No adverse effects were noted in mating or fertility indices. No significant treatment-related differences were found in length of gestation, sex ratio, gestation index, or mean number of pups per litter.
DTIC
Biological Effects; Dosage; Nitrobenzenes; Physiological Tests; Reproduction (biology); Toxic Hazards; Toxicity; Trinitro Compounds;

N96-19129# State Univ. of New York, Albany, NY.
International Symposium: Auditory Plasticity and Regeneration; Scientific and Clinical Implications Final Report
Henderson, Donald; Aug. 1995 10 p Symposium held in Trento, Italy, 5-7 May 1994
Contract(s)/Grant(s): (DAMD17-94-J-4197)
Report No.(s): (AD-A298806) Avail: CASI HC A02/MF A01

The purpose of this project was to organize an international symposium to synthesize and review the findings and issues related to: (1) Auditory system neural plasticity and reorganization; (2) Hair cell regeneration; and (3) Acquired resistance to drug induced hearing loss. To achieve these

goals, a three day International Symposium was held May 5-7, 1994 in Terme di Comano, a secluded conference center just outside of Trento, Italy. The organizers invited 29 well known scientists and clinicians from around the world to present their most recent scientific findings, participate in the discussions, and synthesize what was know about each of the topics outlined above.
Derived from text
Auditory Perception; Central Nervous System; Clinical Medicine; Conferences; Hair; Nerves; Noise Reduction; Regeneration (physiology); Sound Pressure;

N96-19622# Hebrew Univ., Jerusalem (Israel).
Studies on the molecular dissection of human cholinesterase variants and their genomic origins Midterm Report, 1 Jun. 1994 - 31 May 1995
Soreq, Hermona; Jun. 1995 200 p
Contract(s)/Grant(s): (DAMD17-94-C-4031)
Report No.(s): (AD-A299339) Avail: CASI HC A09/MF A03

Research has been focused on the human cholinesterase genes, their variant protein products and the biological roles of these proteins in different tissue - and cell types. To elucidate the biochemical properties and biological functions of this large array of ChE variants, we employed microinjected oocytes and transiently transgenic embryos of Xenopus laevis. This has led to the demonstration that the C-terminal peptide characteristic of the brain and muscle form of acetyicholinesterase (AChE) and butyrylcholinesterase (BuChE) leads to synaptic targeting of these enzymes. Moreover, we were able to show that AChE exerts a morphogenic action on synapse development. The biochemical and biological functions of the BCHE gene and its BuChE protein product were approached by a combination of Xenopus oocyte expression and molecular genetics. Substitution of Asp at position 70 in BuChE by Gly creates an enzyme incapable of hydrolyzing succinylcholine, unlike the native enzyme. This structure-function relationship explained the known clinical syndrome of 'succinylcholine apnea'. The next step was to replace the BuChE peptide harboring Asp70 with that of AChE. This introduced charge modification in the resultant active chimera and explained many of the differences between AChE and BuChE with respect to drug and poison sensitivities. A population diversity study revealed 11% heterozygotes for Asp/Gly70 among Israelis and shed new light on individual variabilities noted for the newly tested anti-AChE drugs, examined for their potential in Alzheimer's therapy. Our current efforts are to extend these studies to elucidate the protective roles of these proteins against organophosphate intoxication, using transgenic mice overexpressing the human ACHE gene.
DTIC
Biochemistry; Cholinesterase; Dissection; Genes; Genetics; Organic Phosphorus Compounds; Proteins;

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Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

N96-17826# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.
An experimental abdominal pressure measurement device for child ATD's Final Report
Deweese, Richard L.; 1 Dec. 1995 11 p
Report No.(s): (DOT/FAA/AM-95/30; NIPS-96-07030) Avail: CASI HC A03/MF A01

An experimental device to measure the abdominal pressure in child-size Anthropomorphic Test Dummies (ATD's) during dynamic tests was developed. A description is provided of the two ATD's in which the device was installed, the CRABI six-month-old and the CAMIX two-year-old size ATD. The test device's construction and installation in the ATD's is described. The instrumented ATD's were used to evaluate the performance of child restraint devices when installed in a typical transport aircraft passenger seat. The restraints evaluated were booster seats, normal lap belts, and a lap-held child restraint called the 'belly belt.' The test severity was 16 Gpk. with an impact velocity of 44 ft/sec. Descriptions of the test setups are provided. Analyses are presented of the pressure measurements acquired from the tests and the ATD/restraint system interactions that produced them.
Author
Abdomen; Aircraft Compartments; Anthropometry; Child Device; Dynamic Tests; Performance Tests; Pressure Measurement; Transport Aircraft Seats;

N96-17933 Helsinki Univ. of Technology, Espoo (Finland). Low Temperature Lab.
Bilateral activation of the human somatomotor cortex by distal hand movements
Salmelin, R.; Forss, N.; Knuutila, J.; (Neuromag Ltd., Helsinki, Finland.) and Hari, R.; 1995 28 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
Report No.(s): (PB95-266961; TKK-F-A737) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

We recorded cortical magnetic signals, simultaneously over the whole scalp, from six healthy subjects during 3 motor tasks to track the varying proportion of contra-vs. ipsilateral activation. The subjects performed self-paced index finger flexions, simultaneous flexion of four fingers, and a sequence of rapid digit movements in different sessions. Index-finger and four-finger movements were associated with phasic bilateral dampening of spontaneous 10 and 20 Hz rythms along the central sulcus, starting approximately 1 s before the movement in the contralateral hemisphere. A rebound occurred within 1 s after the index-finger and four-

finger flexions; the rapid finger movements resulted in a persistent blocking of the rhythms. Averaging with respect to movement onset showed a slow bilateral frontal readiness field starting about 0.5 s prior to motion onset. It was followed, within 200 ms after movements onset, by phasic movement-evoked fields (MEFs) which were bilateral during the tasks involving several fingers. The contra- vs. ipsilateral MEF amplitude ratio C/I decreased from 4.0 during index finger movements to 0.6 during rapid finger flexions, reflecting the enhanced activation of the ipsilateral first somatomotor cortex with increasing complexity of movement.
NTIS
Bioelectric Potential; Cerebral Cortex; Evoked Response (psychophysiology); Magnetic Signals; Psychomotor Performance;

N96-18051# Aurora Technologies Corp., San Diego, CA.
Improved medical x-ray imaging device employing a CdZnTe detector array
Doty, F. P.; 25 Jun. 1995 111 p
Contract(s)/Grant(s): (DAAH01-94-C-R183; ARPA ORDER 5916)
Report No.(s): (AD-A296009) Avail: CASI HC A06/MF A02

The goal of this program is to develop a new method of x-ray imaging in which room temperature semiconductor arrays provide direct, digitized detection. The objectives of Phase 1 have been achieved, and a Phase 2 program to develop a practical instrument for medical radiography has been outlined. The approach of Phase 1 was to experimentally determine the achievable spatial resolution of monolithic cadmium zinc telluride (CZT) arrays, and to evaluate the feasibility of CZT-based imaging systems for medical radiography. For low x-ray energies useful for imaging soft tissue such as the breast, 50 um spatial resolution with virtually 100% detection efficiency was demonstrated, while for higher energy x-rays used for more general radiography 100 - 200 um spatial resolution was demonstrated. Calculated dynamic range of systems using existing commercial multiplexer readouts is 100 times that of film-screen systems. The Phase 1 results provide a basis for design of Cd(1-x)Zn(x)Te instruments for x-ray radiography. The data support electron trapping rather than lateral charge diffusion as the chief mechanism for signal spreading within the semiconductor under conditions of low bias. A model was developed to design Cd(1-x)Zn(x)Te imaging arrays for radiography. Available readout technologies have been surveyed and example detectors have been designed for current-mode imaging using a commercial readout. It is concluded that CZT imagers are presently both technically and economically feasible in scanning or focusing systems, similar to existing systems for breast imaging and fluoroscopy.
DTIC
Arrays; Cadmium Tellurides; Imaging Techniques; Radiography; Semiconductor Devices; Semiconductors (materials); Spatial Resolution; X Ray Imagery; X Rays; Zinc Tellurides;

N96-18182# ManTech Environmental Technology, Inc., Dayton, OH.
Metabolism of 2,2-dichloro-1,1,1 trifluoroethane (HCFC-123) by human hepatic microsomes Final Report, Aug. 1992 - Apr. 1993
Godlin, C. S.; Ketcha, M. M.; Drerup, J. M.; and Vinegar, A.; Nov. 1994 17 p
Contract(s)/Grant(s): (F33615-90-C-0532; AF PROJ. 6302)
Report No.(s): (AD-A299025; AL/OE-TR-1994-0149) Avail: CASI HC A03/MF A01

As part of its safety evaluation, the in vitro metabolism of 2,2-dichloro-1,1,1-trifluoroethane (HCFC-123), a replacement candidate for Halon 1211 by human hepatic microsomes, was assessed. Microsomal incubations containing HCFC-123 ranging from 6 to 75 percent (v/v) in the headspace produced increasing amounts of trifluoroacetic acid (TFA); the kinetics suggested substrate- saturation although substrate inhibition was apparent above a concentration of 36 percent. The rate of TFA formation with respect to pH, time, and protein concentration permitted linear rates of formation to be determined. Rates of TFA formation from incubations conducted at physiological pH, and containing concentrations of HCFC-123 in solution representing estimated concentrations of the chemical in human liver at steady-state, were 67 percent of those obtained under optimal conditions.
DTIC
Fluorine Organic Compounds; Halocarbons; Metabolism; Ph; Proteins; Reaction Kinetics; Steady State;

N96-18562# Arizona State Univ., Tempe, AZ. Dept. of Industrial and Management Systems Engineering.
Studies of the effect of image degradation and recombination Final Report, 1 Mar. 1992 - 1 Sep. 1995
Uttal, William R.; 1 Sep. 1995 87 p
Contract(s)/Grant(s): (F49620-92-J-1076)
Report No.(s): (AD-A299099; AFOSR-95-0568TR) Avail: CASI HC A05/MF A01

During the three year period of this grant, progress was made on two major series of experiments and some minor themes. In the first major one, we examined the effect of noise, brightness, contrast, and geometrical artifacts on a detection task simulating enhanced night vision devices. In the second, we explored the effects of noise, Fourier filtering, reduced acuity (by means of blocking) and combinations thereof on the discrimination and recognition of aircraft silhouettes and faces. The major empirical contribution of this work was the parametric exploration of a number of the key variables in visual perception. The major theoretical

contribution was the proof that the Fourier components of an image were, at best, only a partial determinant of our perceptual response.
DTIC
Enhanced Vision; Fourier Analysis; Night Vision; Optical Filters; Target Recognition; Visual Acuity; Visual Perception;

N96-18570# Office of Naval Research, Arlington, VA.
Acoustical cues for sound localization Final Report, 1 Jan. 1989 - 31 Dec. 1993
Middlebrooks, J. C.; 1994 4 p
Report No.(s): (AD-A299181) Avail: CASI HC A01/MF A01

The specific aims of the study were; (1) characterize the acoustical cues for sound localization; and (2) measure the accuracy with which human subjects localize broad- and narrow-band sound presented at unknown horizontal and vertical locations. The results of research supported by that contract have been published or are in press as eight research articles in peer-reviewed journals, one review article, one book chapter, and six abstracts.
Derived from text
Audio Frequencies; Cues; Sound Localization; Sound Pressure; Sound Transmission;

N96-18615# National Renewable Energy Lab., Golden, CO.
Electric and magnetic fields program overview
Sep. 1995 12 p
Contract(s)/Grant(s): (DE-AC36-83CH-10093)
Report No.(s): (DE95-000206; DOE/GO-10095-014) Avail: CASI HC A03/MF A01

DOE's EMF Program consists of two components: the Biological Mechanisms Research Program and the Research and Public information Dissemination (RAPID) Program is presented. The possibility of biological effects from electromagnetic fields created by electricity is examined. Current research at many National Laboratories is reviewed.
DOE
Biological Effects; Electric Equipment; Electric Fields; Electricity; Electromagnetic Fields; Magnetic Fields;

N96-18786# Krug Life Sciences, Inc., San Antonio, TX.
Development of an operational altitude decompression sickness computer model: Feasibility study results Interim Report, Aug. 1989 - May 1994
Sulalman, Zahid M.; Scoggins, Terrel E.; Ripley, Payson E.; Melkonian, Amy; and Wang, Yun; Aug. 1995 86 p
Contract(s)/Grant(s): (AF PROJ. 7930)
Report No.(s): (AD-A299074; AL/CF-SR-1994-0032) Avail: CASI HC A05/MF A01

In response to the need for a standardized methodology for altitude decompression sickness risk assessment across the wide range of exposures encountered in USAF flight operations, the Armstrong Laboratory's Crew Technology Division initiated a research program in this area in late 1989. The focus of work has been on determining whether development of an operational altitude decompression computer for both predictive and real-time DCS risk assessment is feasible, given the current level of understanding about altitude decompression sickness, the amount of available experimental data, and the inherent variability in individual susceptibility to altitude DCS. The results of this feasibility study indicate that although some technical risk is involved, development of the proposed altitude decompression computer is feasible. This was demonstrated through the implementation of a simplified, preliminary model for altitude DCS risk assessment. This technical report documents the work accomplished during this research effort and provides a road map for development of the desired operational altitude decompression computers.
DTIC
Altitude Sickness; Assessments; Computerized Simulation; Decompression Sickness; Predictions; Pressure Reduction;

N96-19093# ManTech Environmental Technology, Inc., Dayton, OH.
Evaluation of in vitro alternatives to the dog cardiac sensitization assay Final Report, Apr. - Jul. 1994
Frazier, J. M.; Oct. 1994 23 p
Contract(s)/Grant(s): (F33615-90-C-0532)
Report No.(s): (AD-A299028; AL/OE-TR-1994-0147) Avail: CASI HC A03/MF A01

Many halogenated hydrocarbons have been shown to be cardiac sensitizers, i.e., chemicals that alter the sensitivity of the heart to endogenous chemical signals such that under conditions of stress cardiac failure may occur. The best known examples of these agents are solvents and propellants used in aerosol dispensers that have led to the death of 'glue sniffers' as a result of cardiac arrest. The standard toxicological test for cardiac sensitization involves the exposure of dogs to the test agent and the recording of the EKG to determine the cardiac response to a systemic injection of epinephrine. In some cases the experimental procedure is lethal. It would be useful, both from a practical as well as a humane point of view, to have non-whole animal test procedures, possibly in vitro tests, that would provide quantitative evaluation of the risk for cardiac sensitization of candidate chemicals for Department of Defense applications. This report reviews various in vitro models that potentially could be developed for such purposes, including primary cell cultures, cell lines, and isolated organ cultures. At this time, none of the models have been developed for this application. It is apparent that a better understanding of the mechanism

of cardiac sensitization would allow for the more rapid development and validation of non-whole animals test systems.
DTIC
Assaying; Cardiac Output; Dogs; Electrocardiography; Heart; Physiological Responses;

N96-19114# Loyola Univ., Chicago, IL. Parmly Hearing Inst.
Determination of multiple sound sources Final Progress Report, 1 Sep. 1992 - 31 Aug. 1995
Yost, William A.; Sheft, Stanley; and Dye, Raymond; 1 Sep. 1995 11 p
Contract(s)/Grant(s): (F49620-92-J-0489)
Report No.(s): (AD-A299885; AFOSR-95-0680TR) Avail: CASI HC A03/MF A01

This three-year research project had the basic aim of understanding the role of binaural hearing in the ability to segregate multiple sound sources in complex sound environments. There were four main projects undertaken over the past three years: (1) To determine the role of binaural cues in sound source identification; (2) To determine the role of spatial separation in processing amplitude modulation; (3) To develop and validate a paradigm for studying analytic and synthetic processing of multiple sound sources; and (4) To investigate the role of echoes on the ability of listeners to locate and determine the sources of sound. We found that binaural cues do aid in sound source identification, but that the effects were much greater for three rather than for two sound sources. The ability to process amplitude modulation is aided, but only slightly so, by spatially separating the modulated sources. We developed SALT (Synthetic and Analytic Listening Task) for studying processing of multiple sounds and we validated its use in several binaural and one amplitude modulation experiments. We showed that it is the temporal rather than the spectral properties of a sound and its echo that give rise to the pitch that arises when an echo colors the perception of the original sound source. And we have begun a study of the break down of echo suppression by developing a new set of techniques to study echo suppression as it relates to localization.
DTIC
Auditory Perception; Auditory Stimuli; Binaural Hearing; Cues; Echoes; Signal Processing; Sound Transmission; Thresholds (perception);

N96-19458# Biodynamics International, Halifax (Nova Scotia).
Improvements in modeling of pulmonary uptake of toxicants Final Report, for period ending Aug. 1994
Collins, Richard; Nov. 1994 31 p Prepared in cooperation with ManTech Environmental Technology, Inc., Dayton, OH
Contract(s)/Grant(s): (F33615-90-C-0532)
Report No.(s): (AD-A299030; AL/OE-TR-1994-0150) Avail: CASI HC A03/MF A01

The primary objective of this technical report is to provide a rational foundation for quantitatively evaluating the importance of unsteady versus steady or quasi-steady events during uptake of chemical toxicants via the human respiratory tract. A secondary objective is to review critically the current approaches in physiologically-based pharmacokinetic (PBPK) modeling of the lung with a view to generalizing the model descriptions to encompass a broader range of exposure and physiological conditions. The secondary objective is addressed first, with a succinct review of the transport mechanisms that can operate within the respiratory tract when exposed to a concentration of chemical toxicants in the form of vapors, aerosols, and particulate matter. Functional relationships are reviewed within the context of a voluminous body of international literature bearing on this and related subjects of importance. Computational models are proposed to provide an essential complementary research tool with not only simulative but also predictive capabilities. Drawing upon this considerable background of established knowledge, one can proceed more readily with a detailed study of the very important question posed as the primary objective; namely, the establishment of an order-of-magnitude analysis resulting in a general classification scheme that identifies three major flow regimes, distinguished on the basis of whether the flow is dominated by unsteadiness, viscous effects, or the effects of convective acceleration. The report concludes with some important recommendations regarding the extrapolation of test results performed on small laboratory animals to the human context.
DTIC
Exposure; Lungs; Pharmacology; Physiological Effects; Pulmonary Circulation; Toxicity; Transport Properties;

N96-19480# Texas A&M Univ., College Station, TX. Dept. of Mechanical Engineering.
Micromechanics modeling and analysis of Haversian compact bone tissue as a fiber reinforced composite material Annual Report, 1 Apr. 1992 - 31 Dec. 1994
Hogan, Harry A.; May 1995 38 p
Contract(s)/Grant(s): (F49620-92-J-0208)
Report No.(s): (AD-A300105; AFOSR-95-0686TR) Avail: CASI HC A03/MF A01

Haversian compact bone tissue is being studied theoretically and experimentally to characterize its behavior as a fiber reinforced composite material with the aim of biomimicking its salient features. Analytical and finite element based composite micromechanics techniques have been developed and evaluated for theoretical modeling of structure/property relationships. Two-dimensional finite element models of material representative volume elements have been used to predict variations in macroscopic mechanical

properties with porosity, constituent properties, and fiber/matrix interface conditions. Mori-Tanaki effective medium methods have also been examined.
DTIC
Bones; Composite Materials; Fiber Composites; Finite Element Method; Micromechanics; Tissues (biology);

N96-19623# Princeton Electronic Systems, Inc., Cranbury, NJ.
Medical gas diagnosis via diode laser absorption spectroscopy Midterm Report
Sun, Steve; and Ghosh, Chuni; 21 Apr. 1995 19 p
Contract(s)/Grant(s): (DAMD17-94-C-4147)
Report No.(s): (AD-A299343) Avail: CASI HC A03/MF A01

Development of a monitor to measure O2 and CO2 content in the expired air is the objective of this program. We use diode laser based combined wavelength and frequency modulation spectroscopy for detection of the O2 and CO2 in the expired air. A prototype for measuring O2 content was fabricated in November 1994. The prototype provides the necessary signal-to-noise ratio. The acquisition time constant was too long for accurate breath-by-breath oxygen content analysis. The long term system and laser stability have to be improved as well. In the current stage, a second prototype targeted on these issues is being fabricated.
DTIC
Absorption Spectroscopy; Carbon Dioxide; Expired Air; Laser Spectroscopy; Oxygen; Semiconductor Lasers;

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N96-17779*# Miami Univ., Oxford, OH.
Inertial acceleration as a measure of linear vection: An alternative to magnitude estimation Ph.D. Thesis
Carpenter-Smith, Theodore R.; Futamura, Robert G.; and Parker, Donald E.; Psychonomic Society, Inc. 1 Jan. 1995 8 p Repr. from Perception and Psychophysics, v. 57, no. 1, 1995 p 35-42
Contract(s)/Grant(s): (NGT-50427; NAG9-446)
Report No.(s): (NASA-CR-200017; NAS 1.26:200017; NIPS-96-07260) Copyright Avail: CASI HC A02/MF A01

The present study focused on the development of a procedure to assess perceived self-motion induced by visual surround motion - vection. Using an apparatus that permitted independent control of visual and inertial stimuli, prone observers were translated along their head x-axis (fore/aft). The observers' task was to report the direction of self-motion during passive forward and backward translations of their bodies coupled with exposure to various visual surround conditions. The proportion of 'forward' responses was used to calculate each observer's point of subjective equality (PSE) for each surround condition. The results showed that the moving visual stimulus produced a significant shift in the PSE when data from the moving surround condition were compared with the stationary surround and no-vision condition. Further, the results indicated that vection increased monotonically with surround velocities between 4 and 40/s. It was concluded that linear vection can be measured in terms of changes in the amplitude of whole-body inertial acceleration required to elicit equivalent numbers of 'forward' and 'backward' self-motion reports.
Author
Aerospace Medicine; Human Performance; Inertia; Motion Perception; Self Propagation; Visual Perception; Visual Stimuli;

N96-18138*# Thomas Jefferson Univ., Philadelphia, PA. Dept. of Neurology.
Effects of light on brain and behavior c53
Brainard, George C.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 161-181 Sponsored in part by NIMH, the Lighting Research Inst., AFOSR, and the Philadelphia Section of the Illuminating Engineering Society (For primary document see N96-18123 05-54)
Contract(s)/Grant(s): (NAGW-1196) Avail: CASI HC A03/MF A03

It is obvious that light entering the eye permits the sensory capacity of vision. The human species is highly dependent on visual perception of the environment and consequently, the scientific study of vision and visual mechanisms is a centuries old endeavor. Relatively new discoveries are now leading to an expanded understanding of the role of light entering the eye in addition to supporting vision, light has various nonvisual biological effects. Over the past thirty years, animal studies have shown that environmental light is the primary stimulus for regulating circadian rhythms, seasonal cycles, and neuroendocrine responses. As with all photobiological phenomena, the wavelength, intensity, timing and duration of a light stimulus is important in determining its regulatory influence on the circadian and neuroendocrine systems. Initially, the effects of light on rhythms and hormones were observed only in sub-human species. Research over the past decade, however, has confirmed that light entering the eyes of humans is a potent stimulus for controlling physiological rhythms. The aim of this paper is to examine three specific nonvisual responses in humans which are mediated by light entering the eye: light-induced melatonin suppression, light therapy for winter depression, and enhancement of nighttime performance. This will serve as a brief introduction to the growing database which demonstrates how light stimuli can influence physiology, mood and

behavior in humans. Such information greatly expands our understanding of the human eye and will ultimately change our use of light in the human environment.
Author
Biological Effects; Brain; Circadian Rhythms; Light (visible Radiation); Visual Perception;

N96-19117# Dynamics Research Corp., Wilmington, MA.
Validation of crew coordination training and evaluation methods for Army aviation Final Research Note, Feb. - Dec. 1992
Simon, Robert A.; Grubb, Gary N.; and Leedom, Dennis K.; Aug. 1995 211 p
Contract(s)/Grant(s): (MDA903-92-D-0025; DA PROJ. 060-3007-A)
Report No.(s): (AD-A298921; E-785U; ARI-RN-95-45) Avail: CASI HC A10/MF A03

At the request of the U.S. Army Aviation Center (USAAVNC), the Army Research Institute Rotary-Wing Aviation Research Unit (ARIRWARU) developed field exportable training and evaluation materials for aircrew coordination. A testbed of the materials was implemented with the cooperation of the 101st Aviation Brigade. Sixteen aircrews participated. Using a UH-60 flight simulator, aircrews were evaluated while executing a comprehensive tactical mission. Evaluation data were collected before and after aircrew coordination training was provided. Evaluation measures included attitude, behavior, task performance, and mission performance. Results showed that (1) the training had positive effects on all of the measures and (2) the measures are sensitive to changes in performance. The impact on safety of flight was also assessed. The report concludes with recommendations and suggested areas for future research.
DTIC
Aviation Psychology; Coordination; Flight Crews; Flight Training; Military Psychology; Pilot Performance; Training Evaluation;

N96-19132# Utah Univ., Salt Lake City, UT.
Errors in skilled performance Final Report, 1 Jan. 1993 - 30 Jun. 1995
Woltz, Dan J.; and Gardner, Michael K.; 31 Aug. 1995 39 p
Contract(s)/Grant(s): (F49620-93-1-0094; AF PROJ. 2313)
Report No.(s): (AD-A299287; TR-2; AFOSR-95-0567TR) Avail: CASI HC A03/MF A01

First, we discuss Anderson's (1983) ACT theory as the basis of our work on skilled performance errors. Second, we outline conditions we believe promote errors -- long-term priming (training on only a subset of possible problem solution types), short-term priming (presenting multiple surface structure instantiations of a single, deep structure problem type in succession), and working memory load (presenting a concurrent secondary task requiring working memory capacity). Third, we describe our methodology for 'detecting' undetected errors. Fourth, we present our empirical work. Twelve studies are presented on long-term priming. These found general support for the existence of two memory mechanisms, composition and proceduralization, and their respective roles in skilled performance errors. Five studies are presented on short-term priming. These found no support for short-term priming as a process underlying errors, despite its popularity among theorists. One study is presented on working memory which found an increase in latency, but not error rate, due to load (a surprising finding). Finally, two studies investigated individual differences variables related to undetected errors. Self-report questionnaires of error proneness did not correlate with performance errors, but working memory capacity, as measured in performance tests did. Directions for future research are discussed.
DTIC
Cognition; Errors; Human Performance; Retention (psychology); Workloads (psychophysiology);

N96-19136# Army Command and General Staff Coll., Fort Leavenworth, KS.
A historical analysis of US Air Force tactical aircrew error in operations Desert Shield/Storm M.S. Thesis
Kern, Anthony T.; 2 Jun. 1995 97 p
Report No.(s): (AD-A299294) Avail: CASI HC A05/MF A02

This thesis identifies and analyzes tactical aircrew error in the Gulf War and determines various mission effectiveness implications of the errors. From analysis of critical incidents collected from over 400 aircrew members, the study identifies error types, and categorizes them as frequent, common, or infrequent errors. Additionally, the study identifies the percentage of errors associated with the three aspects of mission effectiveness, namely, impact on the combat mission, safety implications, and training implications. The analysis identifies twenty-seven distinct error types. Frequent errors are defined as occurring in over 25 percent of the incidents. They include: (1) Decision making errors, (2) situational awareness errors, (3) procedural errors, and (4) crew coordination errors, in that order of frequency of occurrence. Common errors occurred in greater than 10 percent of the incidents and include: (1) communications errors, (2) pressing too far, (3) regulatory deviation, (4) flight lead errors, and (5) weather related errors. Fifty-two percent of the errors had safety implications, 24 percent had training implications, and 13.6 percent impacted on the mission. Nine and one-half percent could not be reliably classified into any of the three areas.
DTIC
Error Analysis; Flight Crews; Military Operations; Tacan; Warfare;

N96-19142# Illinois Univ., Urbana, IL.
Reminding-based learning Final Technical Report, 21 Jun. 1989 - 20 Jul. 1995
Ross, Brian H.; 5 Sep. 1995 15 p
Contract(s)/Grant(s): (AF-AFOSR-0447-89; AF PROJ. 2313)
Report No.(s): (AD-A299262; AFOSR-95-0571TR) Avail: CASI HC A03/MF A01

When learning new cognitive skills involving problem solving, novices are often reminded of earlier problems. This project examined this common means of learning from remindings. First, the representation of the resulting generalization was investigated. Generalizations from earlier problems may be both selective (only some parts are included in the generalization) and conservative (some superficial aspects are included). The studies found evidence for these characteristics and showed how such generalization may be tied to the use. Second, these remindings may provide a means of becoming more expert in a problem solving domain. Experiments show that even highly experienced solvers rely upon superficial similarities that are predictive of the problem type. Third, an examination of remindings in everyday learning situations extended the findings and better tested some theoretical ideas. The overall results of this project provide a clearer understanding of reminding-based learning and relate it to work on expertise, categorization, and schema acquisition.
DTIC
Cognition; Habituation (learning); Learning; Problem Solving; Retention (psychology);

N96-19156# Pennsylvania State Univ., Hershey, PA. Hershey (Milton S.) Medical Center.
Optimal averaging in performance tests Final Report, May 1986 - Sep. 1989
Jones, Marshall B.; Jan. 1995 32 p
Contract(s)/Grant(s): (MDA903-86-C-0145)
Report No.(s): (AD-A298836) Avail: CASI HC A03/MF A01

The purpose of this research was to develop a methodology for optimizing the temporal stability and predictive validity of performance tests and to apply that methodology to the Project-A, computer-administered tests. In the present research, a performance test is treated as a task to be practiced, and tests are analyzed as individual differences in skill acquisitions and retention. Classical test theory is also used. The predictive validity of the Project-A, computer-administered tests for a simulated anti-aircraft criterion task was studied over a 4-month interval in a sample of 102 college students; the 4-month temporal stability of the tests was studied concurrently in the same sample. Three of the 10 Project-A tests (Choice Reaction, Target Tracking 2, and Cannon Shoot) show a forward stability optimum. Cannon Shoot also has high predictive validity (.59). It could have the highest predictive validity of any test in the Project-A battery if its temporal stability could be improved. In none of these tests, however, can temporal stability be improved by lengthening the tests.
DTIC
Performance Tests; Predictions; Selection; Stability; Students;

N96-19506# Army Aeromedical Research Lab., Fort Rucker, AL.
Time-limited visual resolution in pilot trainees Final Report
Rabin, Jeff; Sep. 1995 8 p
Contract(s)/Grant(s): (DA PROJ. 3M1-61102-BS-15)
Report No.(s): (AD-A300597; USAARL-TR-95-36) Avail: CASI HC A02/MF A01

Superior vision is needed for piloting aircraft in military and civilian environments. Although visual evaluations of potential pilots typically are conducted with no limit on viewing time, aviation and related occupations require superior vision under time-limited viewing conditions, and assessment of this capability is needed. The purpose of this study was to evaluate time-limited visual resolution in pilot trainees. A forced-choice letter recognition task was used to measure visual acuity (VA) and Small Letter Contrast Sensitivity (SLCS) in 37 trainees who had satisfied all vision requirements for pilot training. VA and SLCS were highly correlated (r = 0.76), indicating that the two tests measure similar aspects of visual resolution. However, although VA scores were distributed across 0.16 log units (two lines of letters on a VA chart), SLCS scores varied across 0.35 log units, which is nearly four lines on the SLCS chart. The variation in SLCS performance could be explained, in part, by subtle refractive error in pilot trainees. The results exemplify differences in performance among visually qualified trainees, and underscore the need for proper refractive correction. SLCS is a useful screening test for identifying subtle changes in vision that herald the need for optical or medical intervention.
DTIC
Physiological Tests; Pilot Performance; Time Dependence; Vision; Visual Acuity; Visual Perception; Visual Tasks;

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

N96-17773# Wichita State Univ., Wichita, KS. Dept. of Mechanical Engineering.

Modeling the structural crash response of a vehicle torque box and related crash dynamics of the vehicle occupant Thesis

Qian, Xuping; 1 Sep. 1995 91 p

Report No.(s): (NIAR-95-5; NIPS-96-07035) Avail: CASI HC A05/MF A01

Torque boxes are the main structural components in ground vehicles, trains, etc. They are mainly curved box beams that dissipate energy of impact so that a majority of impact energy as a result of a crash is dissipated before reaching the occupants. Analysis and design of torque boxes have been a subject of intense research for a long time. In this research, a flexible multibody dynamics approach, as well as nonlinear contact forces and plastic hinges are used to simulate the dynamic behavior of a torque box under barrier impact load. The flexibility is included in the analysis using the finite element method incorporating beam elements. Contact forces used are based on the Hertzian contact force law. A hysteresis damping term is included to represent the energy dissipation at the localized contact point. For the representation of large deformations, plastic hinges are introduced by revolute joints between two bodies loaded with elasto-plastic torsional spring-dampers. The data for springs is adopted from an experimental data bank. Different materials are considered in this approach. The structural behavior and energy absorption capacity of different materials are compared and the material with a better energy absorption capacity is identified. The response of the torque box in a crash is used as an input to a vehicle occupant simulation. The obtained occupant injury parameters have been found to be well below the injury threshold values. The relationships between the injury parameters of occupants and structural stiffness are determined and further improvement of the structure is obtained such that the injury parameter values are reduced.

Author

Box Beams; Crashes; Curved Beams; Dynamic Characteristics; Energy Absorption; Finite Element Method; Mathematical Models; Plastic Deformation; Structural Design; Torque;

N96-17827# Wichita State Univ., Wichita, KS.

Analysis, design, fabrication, and testing of a head impact component test apparatus M.S. Thesis

Palaniappan, Prebaker; 1 Sep. 1995 113 p

Report No.(s): (NIAR-95-6; NIPS-96-07034) Avail: CASI HC A06/MF A02

One of the major concerns of the Federal Aviation Administration (FAA) for aircraft safety, is the impact protection for aircraft occupants onto the bulkheads, interior walls and instrument panels. At present impact sled tests of the dummy/seat/restraint and the frontal panel mounted on the sled provide a means of assessing the response of the occupants and the potential for the head injuries in an aircraft crash. As much as these full scale tests are very informative for occupant safety, they are time consuming, and provide too much scatter or variations on the outcome of the Head Injury Criteria (HIC). It is important to use a simple reliable method that may substitute the full scale test for the evaluation of head impact protection. Such substitute would be the pendulum head impact test. This testing can also be used to quantify the crush resistance properties of the padding materials on the back seats, bulkheads, and other interior structures from which optimum properties of the materials can be identified. The test is conducted using both the full scale sled test method and the pendulum head impact test method, and the scatter of the data for the two sets will be determined. The goal of this thesis is to determine the repeatability and compatibility of the pendulum head impact test with the full scale sled testing. A comparison is made between the results (acceleration pulses and HIC values) between the pendulum head impact test and the full scale sled test.

Author (revised)

Aircraft Accidents; Aircraft Safety; Bulkheads; Comparison; Evaluation; Full Scale Tests; Impact Tests; Injuries;

N96-17926 Department of the Navy, Washington, DC.

Compact, portable critical care unit for hyperbaric and recompression chambers Patent

Stanga, Daryl F.; inventor (to Navy)and Flynn, Edward T.; inventor (to Navy)6 Jun. 1995 6 p Filed 29 Apr. 1993

Report No.(s): (AD-D017661; US-PATENT-5,421,340; US-PATENT-APPL-SN-053542) Avail: US Patent and Trademark Office

The advanced care system for use in a hyperbaric chamber is a self-contained, rapidly transportable unit which contains a ventilator, patient suction, and vital signs monitor. It was developed to increase the level of life support available to an injured diver who might require advanced care, along with recompression therapy while being decompressed in an older model decompression chamber or other hyperbaric chamber not equipped with treatment equipment.

DTIC

Diving (underwater); Hyperbaric Chambers; Life Support Systems; Portable Equipment; Pressure Reduction;

N96-18123*# Wisconsin Univ., Madison, WI.

International Lighting in Controlled Environments Workshop

Tibbits, Ted W.; ed.1 Mar. 1994 374 p Workshop held in Madison, WI, 27-30 Mar. 1994

Contract(s)/Grant(s): (NASW-4527)

Report No.(s): (NASA-CP-3309; NAS 1.55:3309; NIPS-96-06266) Avail: CASI HC A16/MF A03

Lighting is a central and critical aspect of control in environmental research for plant research and is gaining recognition as a significant factor to control carefully for animal and human research. Thus this workshop was convened to

reevaluate the technology that is available today and to work toward developing guidelines for the most effective use of lighting in controlled environments with emphasis on lighting for plants but also to initiate interest in the development of improved guidelines for human and animal research. For individual titles, see N96-18124 through N96-18163.
Controlled Atmospheres; Illuminating; Light (visible Radiation); Optical Properties; Photosynthesis; Plants (botany);

N96-18139*# Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD. Laser Microwave Div.
Ocular hazards of light c54
Sliney, David H.; In Wisconsin Univ., International Lighting in Controlled Environments Workshop 1 Mar. 1994 p 183-189 (For primary document see N96-18123 05-54) Avail: CASI HC A02/MF A03

The eye is protected against bright light by the natural aversion response to viewing bright light sources. The aversion response normally protects the eye against injury from viewing bright light sources such as the sun, arc lamps and welding arcs, since this aversion limits the duration of exposure to a fraction of a second (about 0.25 s). The principal retinal hazard resulting from viewing bright light sources is photoretinitis, e.g., solar retinitis with an accompanying scotoma which results from staring at the sun. Solar retinitis was once referred to as 'eclipse blindness' and associated 'retinal burn'. Only in recent years has it become clear that photoretinitis results from a photochemical injury mechanism following exposure of the retina to shorter wavelengths in the visible spectrum, i.e., violet and blue light. Prior to conclusive animal experiments at that time, it was thought to be a thermal injury mechanism. However, it has been shown conclusively that an intense exposure to short-wavelength light (hereafter referred to as 'blue light') can cause retinal injury. The product of the dose-rate and the exposure duration always must result in the same exposure dose (in joules-per-square centimeter at the retina) to produce a threshold injury. Blue-light retinal injury (photoretinitis) can result from viewing either an extremely bright light for a short time, or a less bright light for longer exposure periods. This characteristic of photochemical injury mechanisms is termed reciprocity and helps to distinguish these effects from thermal burns, where heat conduction requires a very intense exposure within seconds to cause a retinal coagulation otherwise, surrounding tissue conducts the heat away from the retinal image. Injury thresholds for acute injury in experimental animals for both corneal and retinal effects have been corroborated for the human eye from accident data. Occupational safety limits for exposure to UVR and bright light are based upon this knowledge. As with any photochemical injury mechanism must consider the action spectrum, which describes the relative effectiveness of different wavelengths in causing a photobiological effect. The action spectrum for photochemical retinal injury peaks at approximately 440 nm.
Derived from text
Eye (anatomy); Light Sources; Radiation Effects; Radiation Hazards; Retina; Vision;

N96-18563# Army Construction Engineering Research Lab., Champaign, IL.
Carbon dioxide and ventilation rates Final Report
Chamberlin, Glen A.; Myers, Darren B.; Jones, James M.; Rojeski, Jr., Peter; and Singh, Harmohindar; Jun. 1995 41 p Report No.(s): (AD-A299145; CERL-TR-95/08) Avail: CASI HC A03/MF A01

In many buildings, the occupants themselves are a major contaminant source. Carbon dioxide (CO2) is one common human-generated contaminant. ASHRAE Standard 62-1989 states that the CO2 level in the indoor air should not exceed 1000 parts per million (ppm). The most common method used to remove such contaminants from indoor air is to bring outdoor air into a building through an air-handling system by mechanical ventilation. However, fresh-air ventilation entails heating or cooling of the outside air to acceptable levels for indoor thermal comfort an energy-expensive process. A system designed to respond to CO2 levels by introducing fresh outdoor air into air-handling systems 'on-demand' may provide the optimal balance between energy efficiency and indoor air quality (IAQ). This study investigated the relationship between ventilation rates and CO2 levels and their interaction in maintaining healthy IAQ, reviewed current gas-sensing technologies, and concluded that further research in the incorporation of gas-sensing technologies into Army Heating, Ventilation, and Air-Conditioning (HVAC) systems is warranted.
DTIC
Air Conditioning; Air Quality; Carbon Dioxide; Gas Detectors; Indoor Air Pollution; Space Heating (buildings); Ventilation;

N96-18605* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
Protective helmet assembly Patent
Dawn, Frederic S.; inventor (to NASA)Eck, John D.; inventor (to NASA)and Weiss, Fred R.; inventor (to NASA) 19 Dec. 1995 6 p Filed 4 Nov. 1992. Supersedes N93-17088 Report No.(s): (NASA-CASE-MSC-21842-1; US-PATENT-5,475,878; US-PATENT-APPL-SN-971116; US-PATENT-CLASS-2-411; US-PATENT-CLASS-2-412; US-PATENT-CLASS-2-6.1;INT-PATENT-CLASS-A42B-3/0) Avail: US Patent and Trademark Office

The invention is a protective helmet assembly with improved safety and impact resistance, high resistance to ignition and combustion, and reduced offgassing. The assembly comprises a hard rigid ballistic outer shell with one or more impact absorbing pads fitted to the interior surface.

The pads are made of open cell flexible polyimide foam material, each of which is attached to the inner surface of the ballistic outer shell by cooperative VELCRO fastener strips of hook-and-loop material affixed respectively to the rigid outer shell and the impact absorbing pads. The helmet assembly with shell and pads is sized to fit relatively close over a wearer's head.
Official Gazette of the U.S. Patent and Trademark Office
Fasteners; Flight Safety; Foams; Helmets; Manned Space Flight; Polyimides; Protective Clothing; Visors;

N96-19077# Rubbright-Brody, Inc., Eagan, MO.
The use of oxygen scavengers and active packaging to reduce oxygen within internal package environments Final Report, Mar. - Sep. 1994
Brody, Aaron L.; Strupinsky, Gene R.; and Pruskin, Lauri R.; (Natick Research, Development and Engineering Center, Natick, MA.)Sep. 1995 135 p
Contract(s)/Grant(s): (DAAK60-94-P-0891)
Report No.(s): (AD-A299164; NATICK-TR-95/033) Avail: CASI HC A07/MF A02

A comprehensive review was performed to characterize the potential for incorporation of oxygen scavengers into package materials to prolong quality retention of food product contents. Sachets or in-package packets, or labels containing iron powder, or ascorbic acid oxygen scavengers have dominated this technology. Most of the developments and commercializations in the field have been from offshore. Further, until 1994, most of the development in incorporating oxygen scavengers into package materials has been performed offshore. Although the application of sachets has been commercial for more than ten years, incorporation into package materials is not yet commercial. Considerable development is underway in the United States and Japan which could result in commercial package materials containing oxygen scavengers in 1995.
DTIC
Food Processing; Oxygen; Packaging; Scavenging;

N96-19509# Army Aeromedical Research Lab., Fort Rucker, AL.
Physical evaluation of the Integrated Helmet and Display Sighting System (IHADSS) Helmet Display Unit (HDU) Final Report
Harding, Thomas H.; Beasley, Howard H.; Martin, John S.; and Rash, Clarence E.; 14 Aug. 1995 42 p
Report No.(s): (AD-A300598; USAARL-95-32) Avail: CASI HC A03/MF A01

The Helmet Display Unit (HDU) of the Integrated Helmet and Display Sighting System (IHADSS) of the AH-64 Apache helicopter was evaluated to establish baseline data for performance figures-of-merit for comparison of future helmet mounted display designs. Measured parameters included physical and optical eye relief, exit pupil size, and position, field-of-view, luminance range, transmittance and reflectance characteristics, and static and temporal response.
DTIC
Ah-64 Helicopter; Figure of Merit; Helmet Mounted Displays; Helmets; Infrared Detectors; Night Vision; Performance Tests; Target Acquisition;

N96-19511# Army Aeromedical Research Lab., Fort Rucker, AL.
ANVIS compatibility with HGU-56/P helmet Final Report
Towns, Deborah R.; and McLean, William E.; Jul. 1995 48p
Contract(s)/Grant(s): (DA PROJ. 3M1-627871897)
Report No.(s): (AD-A300599;USAARL-95-31) Avail: CASI HC A03/MF A01

Physical compatibility assessments of the Aviator Night Vision Imaging Systems (ANVIS) were completed on subjects wearing the HGU-56/P. Data were obtained from 172 subjects participating in a helmet fitting study. Subjects were fitted with the HGU-56/P developer-recommended helmet size based on head length and up to two additional sizes (smaller and larger). On several subjects, compatibility assessments included the M-43A1, type 2, protective mask. Additional measurements of minimum ANVIS eye clearance using rigid head forms were taken to compare with similar data obtained from the subjects. Our results indicate (1) most subjects achieved acceptable ANVIS mechanical compatibility and acceptable eye relief while wearing the HGU-56/P, (2) placement of the ANVIS mount higher on the visor cover will increase compatibility, and (3) fitting one size larger than the developer-helmet size probably will be required to achieve acceptable and comfortable fit while wearing the protective mask.
DTIC
Aircraft Pilots; Flight Clothing; Flight Crews; Helmets; Night Vision;

N96-19627# Armstrong Lab., Wright-Patterson AFB, OH. Crew Systems Directorate.
Relationship between neck strength, anthropometric parameters, and gender with head motion under impact acceleration Annual Report, 23 Jan. - 1 Aug. 1995
Morris, Charles E.; 1 Aug. 1995 12 p
Contract(s)/Grant(s): (MIPR-95MM5582)
Report No.(s): (AD-A300231) Avail: CASI HC A03/MF A01

With the opening of the fighter cockpit to women, it is imperative to expand the current data base of responses of females to high impact acceleration environments. It is hypothesized that since women tend to have less upper-body strength than men, they may not be able to brace their heads as effectively against the loads which occur during impact and escape. This may be exacerbated by the changing center of gravity of helmets due to technological advances (e.g.,

night vision, head-up displays, etc). The objective of the current experimental effort is to examine the ability of subjects of both sexes to brace against an impact acceleration in the X or Y axes, and to attempt to identify a correlation between such ability, static strength measurements, anthropometric measurements, or any combination thereof.
DTIC
Anthropometry; Center of Gravity; Head (anatomy); Head-up Displays; High Acceleration; Human Beings; Human Performance; Impact Acceleration; Neck (anatomy); Night Vision;

55 SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

No abstracts in this category.

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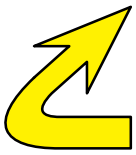

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